

Claims

1. A configurable vibration sensor comprising:
 - one or more sensor circuits;
 - 5 one or more analog-to-digital converters coupled to the one or more sensor circuits, for converting output from the one or more sensor circuits to one or more digital signals; and
 - a processor coupled to the one or more analog-to-digital converters, for processing the one or more digital signals;
 - 10 wherein each of the one or more sensor circuits comprises a vibration sensing element and a variable bandwidth filter coupled thereto; and
 - wherein each variable bandwidth filter of the one or more sensor circuits is controllable by the processor such that the operation of each variable bandwidth filter is variable by the processor.
- 15 2. The configurable vibration sensor of claim 1, wherein the operation of the variable bandwidth filter of each sensor circuit is independently variable by the processor.
3. The configurable vibration sensor of claim 1, further comprising memory
 - 20 coupled to the processor for storing bandwidth settings, wherein each variable bandwidth filter of the one or more sensor circuits is associated with one or more bandwidth settings; wherein in operation, the processor varies the operation of each variable bandwidth filter based on the value of the bandwidth setting associated therewith.
4. The configurable vibration sensor of claim 3, further comprising memory
 - 25 for storing instructions associated with one or more bandwidth configuration algorithms; wherein in operation, the instructions are executed by the processor such that the value of one or more bandwidth

settings are adjustable as determined by the bandwidth configuration algorithms.

5. The configurable vibration sensor of claim 3, wherein the configurable vibration sensor is adapted for coupling to an external device such that the value of one or more bandwidth settings are adjustable by the external device.
6. The configurable vibration sensor of claim 5, wherein the external device is a computer, and wherein the configurable vibration sensor further comprises a digital communications interface for coupling to the computer.
7. The configurable vibration sensor of claim 1, wherein each of the one or more sensor circuits further comprises a variable gain amplifier coupled to the respective vibration sensing element thereof, and wherein each variable gain amplifier of the one or more sensor circuits is controllable by the processor such that the operation of each variable gain amplifier is variable by the processor.
8. The configurable vibration sensor of claim 7, wherein the operation of the variable gain amplifier of each sensor circuit is independently variable by the processor.
9. The configurable vibration sensor of claim 7, further comprising memory coupled to the processor for storing amplifier settings, wherein each variable gain amplifier of the one or more sensor circuits is associated with one or more amplifier settings; wherein in operation, the processor varies the operation of each variable gain amplifier based on the value of the amplifier setting associated therewith.
10. The configurable vibration sensor of claim 9, further comprising memory for storing instructions associated with one or more amplifier configuration

algorithms; wherein in operation, the instructions are executed by the processor such that the value of one or more amplifier settings are adjustable as determined by the amplifier configuration algorithms.

- 5 11. The configurable vibration sensor of claim 9, wherein the configurable vibration sensor is adapted for coupling to an external device such that the value of one or more amplifier settings are adjustable by the external device.
- 10 12. The configurable vibration sensor of claim 11, wherein the external device is a computer, and wherein the configurable vibration sensor further comprises a digital communications interface for coupling to the computer.
13. The configurable vibration sensor of claim 1, further comprising a multiplexor coupled between the one or more sensor circuits and the processor, for providing the processor with output from at least one of the one or more sensor circuits.
- 15 14. The configurable vibration sensor of claim 13, wherein the multiplexor is controllable by the processor such that, in operation, the multiplexor provides output from at least one of the one or more sensor circuits as selected by the processor.
- 20 15. The configurable vibration sensor of claim 1, further comprising a digital-to-analog converter coupled to the processor for converting output generated by the processor into analog form, to facilitate communication of output generated by the processor to an external device adapted to receive analog input.
- 25 16. The configurable vibration sensor of claim 15, further comprising memory coupled to the processor for storing output generated by the processor prior to conversion into analog form, when the output generated by the

processor is to be stored for later conversion into analog form and communication to the external device.

17. The configurable vibration sensor of claim 15, wherein the output generated by the processor for storing in memory comprises at least one of the one or more digital signals.
18. The configurable vibration sensor of claim 1, further comprising a digital communications interface coupled to the processor, for facilitating the communication of at least data between the processor and an external device adapted to receive digital input.
19. The configurable vibration sensor of claim 18, further comprising memory coupled to the processor for storing output generated by the processor, when the output generated by the processor is to be stored for later communication to the external device.
20. The configurable vibration sensor of claim 19, wherein the output generated by the processor for storing in memory comprises at least one of the one or more digital signals.
21. The configurable vibration sensor of claim 18, wherein the external device is a computer.
22. The configurable vibration sensor of claim 21, further comprising a power regulator, wherein the digital communications interface and the power regulator are coupled to the computer through a shared communications medium adapted to transmit power and data; wherein in operation, the power regulator receives power through the shared communications medium for supply to one or more components of the configurable vibration sensor.

23. The configurable vibration sensor of claim 1, further comprising memory coupled to the processor for storing one or more digital filter programs and associated filter configuration parameters; wherein in operation, the processor executes selected digital filter programs such that one or more digital filters are applied to at least a subset of the one or more digital signals based on the configuration parameters associated with the applied digital filters.
24. The configurable vibration sensor of claim 23, wherein the configurable vibration sensor is adapted for coupling to an external device such that one or more filter configuration parameters are adjustable by the external device.
25. The configurable vibration sensor of claim 24, wherein the external device is a computer, and wherein the configurable vibration sensor further comprises a digital communications interface for coupling to the computer.
26. The configurable vibration sensor of claim 1, further comprising an enclosure, wherein the one or more sensor circuits, the one or more analog-to-digital converters, and the processor are provided within the enclosure.
27. The configurable vibration sensor of claim 26, further comprising an external communications interface and a power regulator coupled to the processor, wherein the enclosure permits the configurable vibration sensor to be coupled to an external device only through at least one of the external communications interface and the power regulator.
28. The configurable vibration sensor of claim 27, wherein the external communications interface comprises at least one of: a digital communications interface, and a digital-to-analog converter.

29. A system comprising a plurality of configurable vibration sensors, wherein at least one of the plurality of configurable vibration sensors is the configurable vibration sensor of claim 1, and wherein the plurality of configurable vibration sensors are coupled to a computer through a bus connection.
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30. A sensor circuit for a configurable vibration sensor, the sensor circuit for coupling to a processor through an analog-to-digital converter, the sensor circuit comprising:
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- a vibration sensing element; and
 - a variable bandwidth filter coupled to the vibration sensing element;
- wherein the variable bandwidth filter is controllable by the processor such that the operation of the variable bandwidth filter is variable by the processor.
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31. The sensor circuit of claim 30, further comprising a variable gain amplifier coupled to the vibration sensing element, wherein the variable gain amplifier is controllable by the processor such that the operation of the variable gain amplifier is variable by the processor.